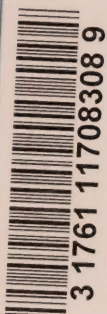


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Government  
Publication

2/ NATIONAL ENERGY BOARD  
3/ REASONS FOR DECISION

In the Matter of an Application under  
the National Energy Board Act

of

Quebec Hydro-Electric Commission

July 1978





NATIONAL ENERGY BOARD

In the Matter of an Application Under  
the National Energy Board Act

RE

QUEBEC HYDRO-ELECTRIC COMMISSION

NATIONAL ENERGY BOARD

July 1978

The Board, having received and considered  
the report of the Presiding Member, Mr. J.  
Farnham, dated December 14, 1977, in 14 of the  
Act, and  
REASONS FOR DECISION  
has satisfied itself with regard to all  
considerations that apply to it in the  
report, hereby adopts that report as the  
basis of its findings and its decision  
on the application.

*J. L. Stille*  
J.L. Stille  
Chairman

*W. J. G. G. G.*  
W. J. G. G. G.  
Associate Vice-Chairman

In the Matter of an Application Under  
the National Energy Board Act

*B. A. G. G.*  
B. A. G. G.  
Vice-Chairman

*R. J. G. G.*  
R. J. G. G.  
Member

of

QUEBEC HYDRO-ELECTRIC COMMISSION

*L. J. G. G.*  
L. J. G. G.  
Associate Vice-Chairman

July 1978

Ce rapport est publié  
séparément dans les  
deux langues officielles





NATIONAL ENERGY BOARD

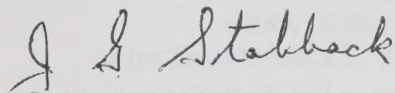
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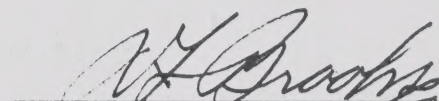
QUEBEC HYDRO-ELECTRIC COMMISSION

July 1978

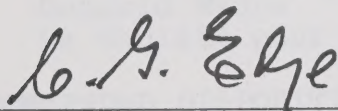
The Board, having received and considered the report of the Presiding Member, Mr. J. Farmer, made pursuant to Section 14 of the Act, and on the basis of that report having satisfied itself with regard to all considerations that appear to it to be relevant, hereby adopts that report as the statement of its findings and its decision on the application



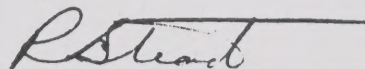
J.G. Stabback  
Chairman



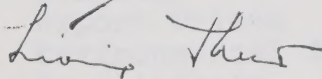
R.F. Brooks  
Associate Vice-Chairman



C.G. Edge  
Vice-Chairman



R.A. Stead  
Member



L.M. Thur  
Associate Vice-Chairman

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REPORT OF THE PRESIDING MEMBER

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## APPENDICES

1. Map: Hydro-Québec: Main Generating Stations and 735 kV System
2. Hydro-Québec: Existing Generating Stations
3. Power: Capacity, Demand and Surplus
4. Energy: Capability, Load and Surplus
5. Terms and Conditions of Export Licence

### For Names

Applicants	1	Quebec Hydro-Electric Commission
Board	2	National Energy Board
Company	3	Quebec Hydro-Electric Commission Limited
Hydro-Québec	4	Quebec Hydro-Electric Commission
Board	5	The New Brunswick Electric Power Commission
Board	6	National Energy Board
Board	7	New York State Board
Board	8	Power Authority of the State of New York
Board	9	Public Service Commission





ABBREVIATIONS USED IN THE REPORT

For Units of Measurement

kV	:	kilovolt
kWh	:	kilowatthour
GWh	:	gigawatthour (1,000,000 kWh)
MW	:	megawatt (1,000 kilowatts)

For Names

Applicant	:	Quebec Hydro-Electric Commission
Board	:	National Energy Board
Cedars	:	Cedars Rapids Transmission Company Limited
Hydro-Québec	:	Quebec Hydro-Electric Commission
NBEPC	:	The New Brunswick Electric Power Commission
NEB	:	National Energy Board
NYPP	:	New York Power Pool
PASNY	:	Power Authority of the State of New York
U.S.	:	United States of America





NATIONAL ENERGY BOARD

IN THE MATTER OF an application by Quebec Hydro-Electric Commission for a Licence under Part VI of the National Energy Board Act to export power and energy.

(File 1923-4/Q2-6)

HEARD at Montreal, Quebec on 6 and 7 June 1978

BEFORE:

J. Farmer

as Presiding Member duly  
authorized by the Board  
for that purpose in accordance with Section 14 of the  
National Energy Board Act.

APPEARANCES:

Nicole Lemieux

Quebec Hydro-Electric  
Commission

Frank Auf der Maur

On his own behalf

Arthur Gardner

Ontario Hydro

Dido Berku

La Société pour Vaincre  
la Pollution

Ann Bigué

National Energy Board





## BACKGROUND

The Applicant, Québec Hydro-Electric Commission, was established in 1944 by a special act of the legislature of the Province of Quebec. Hydro-Québec now operates under the authority of the Hydro-Québec Act, R.S.Q. 1964, c. 86, as amended.

Hydro-Québec owns and operates an electric power system that extends throughout most of the settled areas of the Province of Quebec. By the end of 1977, the Applicant was serving over 2.2 million customers. Of these 1,937,880 were classified as residential, 230,331 as commercial, 73,523 as residential-farm and 10,920 as industrial. The industrial category includes a number of primary industries such as mining and pulp and paper as well as a number of secondary manufacturing industries. The total number of customers has been increasing by about 3 per cent annually.

Appendix 1 is a map showing the main generating stations and 735 kV transmission facilities. At the end of 1977 the Applicant's total installed generating capacity was approximately 12,500 megawatts and the total supply capacity, including firm power purchases, about 17,800 MW. The peak load recorded on the system in 1977 was 15,171 MW; energy sales in 1977 totalled 87,300 GWh. The bulk power transmission voltage is 735 kV.





The main Hydro-Québec system has no synchronous interconnection with neighboring power systems. There are some dozen transmission lines crossing the Ontario-Quebec border, but they are used to connect isolated portions of the Quebec system to the Ontario system. Between Quebec and New Brunswick there is an asynchronous direct-current tie, limited to a rated capacity of 320 megawatts, and an additional 130 MW of New Brunswick load can be supplied radially from the Hydro-Québec system. The transmission lines from Labrador connect the Churchill Falls plant to the Quebec system.

There is likewise no synchronous interconnection between Hydro-Québec and any major system in the United States. There are a number of international power lines from Quebec, mainly low-voltage distribution circuits supplying small localized loads near the international boundary. Only two international power lines are involved in the current application: the Châteauguay-Massena 765 kV line of Hydro-Québec and the Cedars-Massena double-circuit 120 kV line of Cedars Rapids Transmission Company Limited. Under the wheeling agreement of 7 December 1973 between Cedars and Hydro-Québec, Cedars wheels power to the international border for a charge of 0.5 mill\* per kWh.

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\* One mill is one thousandth of a dollar (1 mill = \$0.001)



Hydro-Québec holds Licence EL-96, issued by the Board in 1976, for the export over these same two lines of 800 MW of seasonal "Diversity Power" and associated energy from April to October of each year. EL-96 will expire on 31 October 1991, or 13 years from the date of commencement of the export, whichever day occurs first.\*

---

\* NEB Report to the Governor in Council on the application of Hydro-Québec, September 1976.





### THE APPLICATION

The application by Hydro-Québec dated 17 October 1977 is for a licence to export interruptible power and energy\* according to the terms of the Interconnection Agreement of 31 May 1976 between the Applicant and the Power Authority of the State of New York (PASNY) for a period of five years and seven months from 1 June 1978 to 31 December 1983.

The maximum amount of power proposed for export is 1,360 MW. The maximum annual energy export would be 3,274 GWh in 1978, 7,200 GWh in each of 1979, 1980 and 1981, and 10,200 GWh in each of 1982 and 1983.

Export power would be generated at the Applicant's Beauharnois and Les Cèdres generating stations on the St. Lawrence River and transmitted to PASNY over the Châteauguay-Massena 765 kV line and the Cedars double-circuit 120 kV line. The groups of generators supplying the proposed export would be electrically disconnected from the Hydro-Québec system and connected instead to the U.S. system via the international power lines.

---

\* Interruptible power and energy are defined as power and energy made available under an agreement that permits curtailment or cessation of delivery at the option of the supplier.



THE INTERCONNECTION AGREEMENT

The application is based on the Interconnection Agreement of 31 May 1976 between Hydro-Québec and PASNY. This Agreement anticipates mutual assistance in the event of emergencies and additional benefits including the purchase and sale of surplus capacity and energy. The Agreement provides for a variety of interruptible transactions as outlined below:

<u>Class</u>	<u>Description</u>	<u>Demand Charge</u>	<u>Energy Charge</u>
Economy Energy	from non-renewable energy sources	-	$\frac{1}{2}$ (incremental cost + decremental cost)
Fuel Replacement Energy	from renewable energy sources	-	80% of decremental cost, less delivery cost
Tertiary Energy	any energy not included in another class	-	As agreed by Operating Committee
Inadvertent Energy	unscheduled energy	-	No charge. To be balanced in subsequent deliveries.
Capacity Power	power by the day	\$90/MW/day	Higher of 110% of incremental, or as agreed by Operating Committee but not less than charge for Fuel Replacement Energy.
Short Term Power	power by the week	\$450/MW/week	As above
Supplementary Energy	provided off-peak to supplement storages (hydraulic or fuel)	-	As above





The Interconnection Agreement defines incremental cost as the cost incurred by the party supplying the energy which would not have been incurred had the transaction not taken place. Decremental cost is the net sum of all the costs to which party to whom energy is supplied would avoid.

Economy Energy is defined as energy from non-renewable resources which is delivered in order to effect a saving when the receiving party has adequate generating capability available to carry its own load. Fuel Replacement Energy is defined as energy from renewable resources and delivered to replace energy from non-renewable resources in order to effect savings and economize non-renewable resources.

Capacity Power is defined as power and associated energy provided on a day-to-day basis and required either to supplement or replace available generating capacity. Short Term Power is defined as power and associated energy provided for periods of one or more weeks and required to supplement or replace available generating capacity.

The terms, including the rates and charges, are subject to review at least every two years, or more frequently at the request of either party.



THE EVIDENCE: EXPORT OF POWER AND ENERGY

Generating Capacity and Additions

In 1977 the generating capacity available to the Hydro-Québec system was approximately 17,800 MW. This total includes some 11,700 MW of hydraulic capacity and 820 MW of thermal capacity from the Applicant's own generating stations as shown in Appendix 2, as well as approximately 5,300 MW of firm purchases of which the greatest part is from Churchill Falls, Labrador. To supply the anticipated load growth in Quebec, the Applicant is developing several large hydroelectric sites, notably along the La Grande River in the James Bay region and on the Manicouagan-Outardes river system which flows into the eastern part of the St. Lawrence from the north. By 1983 the total supply capacity is scheduled to be approximately 25,200 MW.

Testimony was given that the generating expansion program is designed solely to meet the expected Hydro-Québec internal demand and not to create surplus for export. The application states that no new installation is required for the proposed export.





Surplus: Capacity and Energy

The application includes forecasts of the power and energy requirements of the Hydro-Québec system for each month throughout the requested licence period. Testimony showed that Hydro-Québec prepares its load forecasts using a combination of methodologies including extrapolation of trend lines, econometric modelling and demographic parameter estimation. The resulting estimates are then modified for the immediate future on the basis of short-term considerations. It should be noted that the forecasts include both the main system and the Abitibi system which are separate at present but are scheduled to be interconnected by the end of 1979.

The Applicant's estimates of generating capacity, load and desired reserve for the months of January and July for each year of the proposed export are shown in Appendix 3. Examination of the monthly tables supplied with the application, from which Appendix 3 is derived, shows that Hydro-Québec expects its generating capacity to be most fully loaded during January and least loaded during July. Examination of Appendix 3 shows that the Applicant expects to be deficient in generating capacity during each January but will have substantial surplus at other times of the year. A witness testified that the January load will be met in spite of these deficits by cutting into the planned reserve, while still maintaining adequate spinning reserve



to ensure against possible loss of even the largest generating unit.

The Applicant's estimates of annual energy capability, demand and surplus for both average and maximum river flow conditions are summarized in Appendix 4. Examination of Appendix 4 shows annual energy surpluses ranging from 9,374 to 20,072 GWh in 1978 and from 5,949 to 16,978 GWh in 1983, depending on streamflow conditions.

A witness for the Applicant testified that it was important to emphasize that transactions of the type foreseen by the Interconnection Agreement are of short duration; generally less than a day or, in some cases, a week. He reiterated that any transaction can be discontinued if, in the opinion of the supplying party, that transaction is not compatible with the secure and wise operation of its own system.

A witness testified that in 1977 Hydro-Québec had spilled water that could have been used to generate approximately 5000 GWh of energy. He said that most of this energy could probably have been sold if Hydro-Québec had been able to export it over the 765 kV interconnection, which was still under construction.

The Applicant proposes to supply both the requested export and the already-licensed "Diversity Power" to PASNY from a group of selected generating units at Beauharnois and Les Cèdres. In order to effect an export, a group of units would be electrically isolated from the





Hydro-Québec system and synchronized instead to the PASNY system. The isolated units would amount to a maximum of 1,360 MW of the total capacity of 1,748 MW available at Beauharnois and Les Cèdres. The remaining capacity is connected to the Hydro-Québec system to serve local loads. Testimony showed that under maximum flow conditions in the St. Lawrence River these two stations could generate 13,000 GWh annually of which 10,200 GWh could be made available for export; under average flows the production would be 11,290 GWh per year of which approximately 8,300 GWh would be available for export.

#### Export Markets

The customer for the proposed export is the Power Authority of the State of New York. PASNY is a public corporation which generates and sells electric energy to other utilities and industries in New York. The evidence showed that PASNY would resell the interruptible power and energy to other members of the New York Power Pool. The members are: Central Hudson Gas and Electric Corporation, Consolidated Edison Company of New York, Inc., Long Island Lighting Company, New York State Electric and Gas Corporation, Niagara Mohawk Power Corporation, Orange and Rockland Utilities, Inc., Rochester Gas and Electric Corporation and PASNY. During 1978 the members of the New York Power Pool expect a total energy load of over 120,000 GWh.



Offers to Canadian Utilities

The Applicant sent identical letters, dated 14 November 1977, to Ontario Hydro and The New Brunswick Electric Power Commission. Enclosed with the letters were copies of the application made to the Board. The letters asked the recipients for responses to the effect that the proposed export would not be in conflict with transactions between Hydro-Québec and the recipients during the export period.

By letter of 9 January 1978, The New Brunswick Electric Power Commission replied that it supported Hydro-Québec's application as long as it continued to have access to similar types of power from Quebec at prices which compared favourably with those which would be charged to U.S. utilities.

Ontario Hydro replied by letter dated 24 April 1978 that it had no objection to the granting of the application provided that any licences which were issued be conditioned to require that priority be given to Canadian loads.

Under cover of a letter dated 1 May 1978, the Applicant sent a copy of its application to St. Lawrence Power Company which replied by a letter dated 16 May 1978 requesting conditions which would grant priority to Canadian loads if a licence were issued.



### Export Prices

It is stated in the Interconnection Agreement that all rates and charges are in Canadian funds. Payments due to Hydro-Québec would be made in Canadian funds. Payments due to PASNY would be made in the U.S. equivalent of Canadian funds, converted at the rate of exchange as quoted by the Bank of Canada at noon on the last business day of the month.

Testimony showed that Economy Energy sales would come only from the oil-fired Tracy plant or gas turbines. It was testified that such sales would take place only in the event of emergency in the United States.

The evidence indicated that most export sales by Hydro-Québec were expected to be classified as Fuel Replacement Energy. For this classification of energy, the Interconnection Agreement sets the price as 80 per cent of the buyer's decremental cost, less any cost of delivery. A witness for the Applicant testified that Hydro-Québec favoured this pricing arrangement over the more common split-savings formula associated with economy energy sales because the low incremental cost of hydraulic generation does not fully reflect its value and results in unduly low prices under the split-savings arrangement.

To demonstrate how the actual price of Fuel Replacement Energy would be derived, the Applicant provided two tables of computations entitled "Estimate of Payments associated with a hypothetical purchase of Fuel Replacement





Energy by PASNY for resale to the New York Power Pool". The two tables, one for a week-day, the other for a Saturday, were based on actual purchases made by the NYPP from an external source during November 1977, but illustrate how the price would have been calculated had the energy been supplied by Hydro-Québec. The tables show hour by hour the buyer's decremental cost, the amount of energy purchased, the buyer's cost, the buyer's saving, the NYPP wheeling payment, the PASNY transmission charge, and Hydro-Québec's resulting sale price.

It was stated at the hearing that the delivery cost which would be subtracted from 80 per cent of the buyer's decremental cost in order to arrive at Hydro-Québec's price for sales of Fuel Replacement Energy would comprise the NYPP wheeling payment plus the transmission payment to PASNY.

Cross-examination showed that the NYPP wheeling payment is currently 9.8 per cent of the buyer's saving where purchased energy is wheeled over another member's circuits. In an export of Fuel Replacement Energy, the NYPP wheeling payment would be deducted from the Hydro-Québec selling price. For the other types of exports proposed in the application the payment would be made by the purchaser.

Testimony showed that the PASNY transmission charge would be a constant one U.S. mill per kWh. For exports of Fuel Replacement Energy the charge would be payable by



Hydro-Québec to PASNY. For other types of exports contemplated in the Interconnection Agreement, it would be payable by the purchaser. Testimony showed that PASNY levies this charge for use of its 765 kV transmission facilities in order to cover operating expenses in a manner similar to that employed by other members of the NYPP who recover expenses through the NYPP wheeling payment.

The two tables demonstrating hypothetical exports of Fuel Replacement Energy include average figures for each 24-hour period. The table for a week-day shows, in U.S. mills per kWh, a buyer's decremental cost of 22.45, a buyer's cost of 17.96 (80 per cent of 22.45), a buyer's saving of 4.49, the NYPP wheeling payment of 0.449 (calculated for this example as 10 per cent of the buyer's saving rather than the more exact 9.8 per cent given in testimony), the PASNY transmission charge of 1.0 and the seller's price of 16.51. The table for a similar hypothetical sale on a Saturday shows slightly lower figures, resulting in a seller's average price of 14.63 U.S. mills per kWh.

A witness testified that, as the Operating Committee had not yet met, he could not state the prices for the energy that would be associated with the proposed sales of Short Term or Capacity Power, nor for Supplemental or Tertiary Energy. He pointed out, however, that under the terms of the Interconnection Agreement the prices for





Supplemental Energy and energy associated with sales of capacity could not be less than the price for Fuel Replacement Energy. He stated that the price for any sale under the category of Tertiary Energy would have to be negotiated at the time of the sale and would depend heavily on the circumstances at the time.

#### Costs Incurred in Canada

A witness testified that Hydro-Québec does not know the exact incremental cost of its hydroelectric generation. He stated that this cost had at one time been set by negotiation with Ontario Hydro at 0.70 mill per kWh and with NBEPIC at 0.75 mill per kWh for the purpose of administering the Applicant's interconnection agreements with those two utilities.

Another witness explained that the rates of 0.70 and 0.75 mill per kWh represent operating and maintenance costs only. He said that this was not the total incremental cost of hydroelectric energy because the water in storage has some intrinsic value which varies with storage levels. He emphasized that the Interconnection Agreement with PASNY places no obligation on Hydro-Québec, either to sell any particular quantity of energy or to accept any particular price. He said that sales would be made only when the available export price was higher than the value of the stored water.



The only other cost which might be incurred in Canada as a result of the proposed export would be a transmission charge of 0.5 mill per kWh which would be payable to Cedars Rapids Transmission Company if the Cedars lines were used for export.

#### Equivalent Domestic Prices

In order to demonstrate that the export prices would not be less than the prices charged to Canadians for equivalent service, the Applicant stated that it would make available to accessible Canadian systems any capacity or energy which it proposed to export, and at the export price adjusted for possible differences in the cost of delivery. Witnesses added that Hydro-Québec sells fuel replacement energy to industries in Quebec priced at 80 per cent of the cost of the replaced fuel.

The Applicant has supplied copies of its Interconnection Agreements with both Ontario Hydro and The New Brunswick Electric Power Commission. Under these agreements the price for sales of economy energy would be such as to effect equal savings between the parties. Under cross-examination, witnesses for the Applicant testified that Hydro-Québec had recently made sales of economy energy to Ontario Hydro at 6 to 8 mills per kWh and to The New Brunswick Electric Power Commission at 7 to 11 mills per kWh. In the example describing a hypothetical sale of Fuel



Replacement Energy to PASNY, Hydro-Québec's average price was 16.51 U.S. mills per kWh.

Least Cost Alternative

In order to demonstrate that the proposed export prices would not be materially less than the cost of alternatives in the export market area, the Applicant pointed out that the other interconnection agreements to which PASNY and other members of the New York Power Pool are parties allow them to purchase economy energy on a split-savings basis, whereas the energy to be exported from Quebec would be priced at 80 per cent of the receiving party's decremental cost.

In response to a request from the Board for further details, the Applicant supplied tables which were prepared by PASNY based on actual transactions between the New York Power Pool and an external source which took place on a Saturday and a week-day in November 1977. These tables outlined the transactions which formed the basis of the tables of hypothetical export sales described earlier under the heading Export Prices. These latter tables show a buyer's average net cost of 18.98 U.S. mills per kilowatthour over the 24 hour week-day period whereas the tables described earlier showed that the buyer's average net cost would have been 17.96 U.S. mills per kilowatthour if the energy had been purchased from Hydro-Québec.





Regarding the cost of alternative sources of capacity purchases, a witness who is employed by PASNY testified that the charge for Supplemental Capability and Energy under the New York Power Pool Agreement of 4 April 1977 is \$3.00 U.S. per megawatt per hour plus the energy charge. He also testified that under the Interconnection Agreement between PASNY and Ontario Hydro, PASNY could purchase capacity power for \$90.00 per megawatt per day. He stated that the prices in the agreement between the New York Power Pool and Ontario Hydro were \$100.00 U.S. per megawatt per day and \$500.00 U.S. per megawatt per week, but that these were higher because they had been recently renegotiated. The comparable prices in the Interconnection Agreement between the Applicant and PASNY are \$90.00 per MW per day and \$450 per MW per week.

#### Environmental Effects

The application states that Hydro-Québec would not have to make any addition to its existing installations in order to effect the export. Moreover, the Applicant would not use its gas turbines or its oil-fired Tracy plant to generate power for export except in the case where PASNY required emergency assistance which could not be provided from hydraulic sources. Regarding the Applicant's future



nuclear station, Gentilly II, the application states that it will be operated as a base-load plant and that its operation would therefore not be affected by the proposed export.





### INTERVENTIONS

Three interventions relative to the application were received. A brief summary of each submission and supporting evidence follows.

#### Mr. Frank Auf der Maur

Mr. Auf der Maur, an engineer and a resident of Quebec, submitted a written brief and elaborated on it at the hearing. He criticized the proposed export for the following reasons.

His first reason had to do with the proposed export prices. He stated that whereas prices in most fields are set by the seller, in this case the prices for sales of some categories of energy were to be determined by the decremental costs in the New York Power Pool. He felt that this arrangement would not provide Hydro-Québec with enough control over the export prices. He also claimed that the proposed prices were too low. He said they did not reflect capital related costs of constructing generating facilities. He submitted a number of tables compiled from reports published by the member utilities of the New York Power Pool. He stated that according to his calculations the average



generating cost in the NYPP was 39 mills per kilowatthour.

Mr. Auf der Maur contended that the export would fortify U.S. industry at the expense of Quebec industry. He felt that energy at the export prices could be used to bolster industrial development in Quebec and that the exports should not be made for this reason.

He also objected to the proposed export on the grounds that if the energy were sold to Ontario Hydro instead of being exported, fossil-fired generation in Ontario could be reduced, with an attendant reduction in the emissions of pollutants. He claimed that this would result in a reduction in air and water pollution in the province of Quebec.

#### Ontario Hydro

Ontario Hydro's intervention supported the application, with the provision that the usual Canadian priority clauses be included in any licences which might be issued. At the hearing Ontario Hydro was represented but neither cross-examined witnesses nor filed evidence of its own.

#### La Société pour Vaincre la Pollution

This intervenor, which is an environmental group with about 500 members, accepted the principle that Quebec should help its neighbours in case of emergency, but objected



to having Hydro-Québec supply its neighbours in a continuing fashion at the expense of the long-term well-being of the population of the province. A witness for the intervenor, a professor of Economics at McGill University, stated that a clear distinction should be made between equal exchanges of energy and net exports and that the two should be priced differently. He accepted exchanges as being desirable but said that as it appeared that substantial net exports would take place they should be priced so as to recover the marginal costs associated with the facilities used to generate them. He stated that the minimum export price should be this marginal cost, including capital costs, of new electrical developments in Quebec and that the maximum price should be the marginal cost, including capital costs, of new developments in the State of New York.

The intervention claims that the proposed export would throw Quebec into a vicious circle: to export in order to be able to borrow capital and, in turn, to enter into debt in order to export.

Another witness for the intervenor, also an economist, testified that the capital requirements of Hydro-Québec were so large that they were restricting the ability of the provincial economy to support investment in other sectors. She testified that Hydro-Québec has been increasing its capital requirements rather than decreasing





them and claimed that the utility is having more and more difficulty borrowing capital. She stated that the social costs attributable to the high investment required for new power projects were higher than the prices proposed for the export. She also claimed that Hydro-Québec's estimates of surplus had increased with each application to the Board.

In its written brief the intervenor stated that the terms of the Interconnection Agreement were less advantageous on a number of points than those obtained by Ontario Hydro in similar agreements. It pointed out that for short-term power Hydro-Québec was asking \$450 per megawatt per week while Ontario Hydro was receiving \$500 per megawatt per week.



### RECOMMENDED DISPOSITION

As Presiding Member I have considered all the evidence and submissions made to me concerning this application and my analysis of them leads me to the following Recommended Disposition.

#### Application for Export

Section 83 of the National Energy Board Act requires the Board, in examining an application for an export licence, to have regard to all considerations that appear to it to be relevant. In particular the Board is required to satisfy itself that the power to be exported is surplus to reasonably foreseeable Canadian requirements and that the price to be charged is just and reasonable in relation to the public interest. I have therefore examined the evidence on the basis of these provisions.

#### The Nature of the Proposed Export

The application is for a licence to export interruptible power and energy. Interruptible energy produced from excess streamflows is a function of weather conditions and is by its nature unpredictable. It is electricity available at the option of the supplier rather than at the demand of the consumer. As such, it has an extremely limited market among industrial customers and can





normally be sold only to electrical utilities with thermal generation to enable them to reduce their consumption of fuel. It appeared from their evidence and arguments that the two intervenors opposing the application did not fully appreciate this essential difference between interruptible power and the electricity which a normal consumer buys from a utility with the understanding that it will be available whenever it is required.

### Surplus

Because the application is for the export of only interruptible power and energy, it is not essential for the Applicant to have a surplus throughout the period under consideration. Testimony at the hearing showed that the Applicant plans its system to meet the power and energy requirements of the Quebec load and that no new installation would be required to serve the proposed export.

On any power system with a variable load and a pronounced annual peak, idle generating capacity will be available during off-peak periods. On a system such as that of Hydro-Québec, which is predominantly hydroelectric, any streamflows which are above the level required to meet the provincial system load will be available to generate surplus energy for sale on an interruptible basis. If the excess streamflows are not utilized for this purpose, the water



may be spilled unused over the dams. Examination of Appendix 4 shows that under maximum streamflow conditions the Applicant would have energy surpluses well in excess of the requested licence limits.

La Société pour Vaincre la Pollution included a graph in its intervention which purports to show that Hydro-Québec's surplus has been larger with each succeeding appearance before the Board. Analysis of the graph shows that the two lower curves correspond to the original and revised estimates provided by Hydro-Québec with the application for the "Diversity Power" export. Those estimates are based on average streamflows. The third curve corresponds to estimates of surplus provided with the present application based on maximum streamflows. Had this intervenor analyzed the present estimates based on average streamflows, it would have discovered that the Applicant's estimates of surplus energy are now less, not greater, than they were at the time of the last hearing.

The evidence shows that the amounts of interruptible power and energy proposed for export plus the amounts already licensed under EL-96 can be produced at Beauharnois and Les Cèdres generating stations where the power for export would have to be generated, even after allowance is made for the local loads served from these stations.

The licence limits requested by the Applicant are based on the facts that under maximum streamflows 10,200 GWh



per year can be generated for export at Beauharnois and Les Cèdres, and, that under EL-96 the Applicant is authorized to export 3,000 GWh in each year from 1978 to 1981. The limit of 7,200 GWh requested for each full year up to 1981 takes into account this energy associated with the export of "Diversity Power". However, after 1981, the Applicant may, with the Board's prior approval, continue to make net exports of up to 3,000 GWh annually under EL-96. In this event the amounts which would be available for export under the proposed interruptible licence would be less than the 10,200 GWh requested by the Applicant for 1982 and 1983. Any licence which is issued should contain a condition which takes this possibility into account by defining the energy limit in any given 12-month period as 10,200 GWh, less actual net exports under EL-96.

Before any interruptible power or energy were committed for export, it would first have to be offered for sale to neighbouring Canadian utilities, in this case, NBEP, Ontario Hydro and St. Lawrence Power Company. Only if it were not needed in Canada would it be available for export.

I am therefore satisfied that the power and energy proposed for export is surplus to foreseeable Canadian requirements, subject to the licence conditions already described to define the maximum annual export quantity and to provide for Canadian priority.





### Export Prices

The prices for exports under several categories outlined in the Interconnection Agreement are to be set by an Operating Committee which has not yet met. This committee, however, is constrained by the terms of the Interconnection Agreement to set the prices equal to or greater than the price for Fuel Replacement Energy. The only possible exception might be for an occasional sale under the Tertiary Energy category where the price would be very much dependant on the circumstances.

It is clear from the evidence that the export revenues would be well in excess of the costs which would be incurred in Canada. As all the facilities required to make the proposed export are necessary to supply the load in Quebec, the only additional expense is the incremental cost of producing the energy. For hydroelectric sources this is not known exactly but is evidently less than 1 mill per kWh.

Any exports from thermal generation would not be sold for less than 110 per cent of the incremental cost. The only other cost which might be incurred in Canada due to the proposed export is the wheeling charge of 0.5 mill per kilowatthour payable to Cedars Rapids Transmission Company in the event its line were used for export.

On the basis of the evidence I find that the export



prices are not less than the prices charged in Canada for similar transactions. The Applicant would offer any proposed exports to accessible Canadian utilities at the proposed export price adjusted for possible differences in the cost of delivery. This is a standard requirement of all interruptible licences.

I am satisfied that the proposed export prices are not materially less than those for alternative supplies in the market area. The alternative to purchases of interruptible power from Hydro-Québec under the Interconnection Agreement would be purchases under other interconnection agreements to which members of the NYPP are party. Under the terms of such agreements, NYPP members can enter into similar transactions at similar prices to those in the Interconnection Agreement under consideration. The only classification of transaction which is unique to the present application is Fuel Replacement Energy, which the evidence shows is designed to give Hydro-Québec higher prices than would otherwise be available.

Because certain of the export prices are to be determined by the Operating Committee, any export licence would have to include a condition requiring the Applicant to file its proposed price levels with the Board when they are first set and whenever they are revised.

La Société pour Vaincre la Pollution objected to the proposed export prices, arguing that any net exports



should be priced to recover the marginal cost associated with new generating facilities in Quebec. There are two reasons why I cannot accept this argument. Firstly, the evidence shows that those new developments which were referred to by the intervenor are required to meet the load in Quebec and are not being constructed to generate power for export. Secondly, the U.S. utilities are under no obligation to buy, and if Hydro-Québec priced its interruptible energy above or even at the U.S. decremental cost, the energy would simply remain unsold.

Mr. Frank Auf der Maur argued that the prices were too low because they would result in prices which were substantially less than alternatives in the market area. I cannot accept his argument because his calculation of 39 mills per kWh for average costs within the New York Power Pool includes costs such as capital and other fixed charges. Such fixed charges are incurred whether interruptible purchases are made or not. Purchases of interruptible energy are made to reduce generation costs, but the purchaser must have sufficient generating capacity available and ready to be operated on little or no notice if the supply is interrupted. A calculation including fixed charges is therefore inapplicable for evaluating interruptible energy prices. Exports of capacity, which in effect would temporarily replace or augment NYPP generating capacity, do carry a





substantial demand charge in addition to the energy charge.

It is natural to seek to maximize the price of exports. We must keep in mind, however, that energy prices which were as high or higher than decremental costs would leave no profit margin for the purchaser and would simply eliminate sales. The pricing formula, 80 per cent of decremental less transmission charges, leaves a small profit margin for the buyer, and a large profit for Hydro-Québec. A fixed price might be too high, eliminating sales, or too low, reducing profit.

The only classification of sale for which the Interconnection Agreement provides no specific pricing formula is Tertiary Energy. The evidence shows, however, that this classification would be used very rarely and only for unforeseen eventualities, with the price then being determined by negotiation. The setting of export prices by bargaining has been accepted by the Board in certain cases, coupled with close monitoring by NEB of all export transactions as to both quantity and price. In the present case the Canadian interest would be further protected by the assurance that if the negotiated price of Tertiary Energy appeared low, Ontario Hydro would undoubtedly exercise its option to preempt the export. In view of the expected rare use of Tertiary Energy as a classification, illustrated by a witness as twice in 50 years to Ontario, I recommend that



Hydro-Québec be allowed to set the price by negotiation but be required to report each individual use of this classification promptly to the Board by Telex. I feel that the public interest would be better served by thus allowing Hydro-Québec some flexibility in the pricing of this rather rare classification of transaction than by any arbitrary control which, if it prevented a sale, might result in water being spilled unused over the dams.

All things considered, I am satisfied that the prices which Hydro-Québec proposes to charge are just and reasonable in relation to the public interest.

#### Environmental Impact

The evidence shows that the vast majority of the exports would come from the Applicant's hydraulic installations which have been installed to supply the Quebec load. While generating energy for export these installations would continue to be operated within the existing constraints. Testimony showed that only in the event of emergency in the United States would exports be made from the Applicant's gas turbines or the Tracy oil burning plant. I am therefore satisfied that no material environmental impact would result from the production of the energy involved in this application.



### Social Costs

La Société pour Vaincre la Pollution raised the question of social costs. Since there would be no material environmental impact resulting from the export it follows that there would be no environmental social costs attributable to it. Any social costs due to Hydro-Québec's borrowings are not relevant here because the export would require no new facility and therefore no additional borrowing. Whatever social costs there are would be the same whether the export were made or not.

### Claimed Disbenefits

The two intervenors opposing the application argued that exporting electricity leads to the export of jobs. While this argument might be true in the case of an under-priced firm export, it is not true in the case of the proposed interruptible export. Because of its interruptible nature, the power proposed for export is unsuitable as a basis for industrial expansion. Mr. Auf der Maur felt that the power might be attractive to the aluminum or chlor-alkali industries. I find it inconceivable that either could survive on an energy supply which was interruptible. At any rate, if such an industry exists or comes into existence in the future, then it will have the right to purchase the power before it is exported.





Mr. Auf der Maur also felt that the energy should be used to reduce pollution attributable to thermal generation in Ontario rather than being exported. Ontario thermal stations, however, are operated under provincial environmental regulations. In any case, Ontario Hydro has the right to purchase any power that may be exported. This is a standard condition of any licence for the export of interruptible power and the Applicant's intention to comply with it is clearly stated in the application.

#### Benefits of Exports

In addition to surplus, price and environmental effects, another consideration that I wish to point out to the Board is the substantial body of benefits that would accrue to Hydro-Québec and therefore to its customers as a result of the exports. I was impressed by the evidence that in 1977 Hydro-Québec spilled the equivalent of 5,000 GWh of energy. Based on the evidence placed before me, this energy would have had an export value of some \$70 million, almost all profit. Exports at a substantial profit will tend to reduce the cost of electricity to consumers in Quebec.

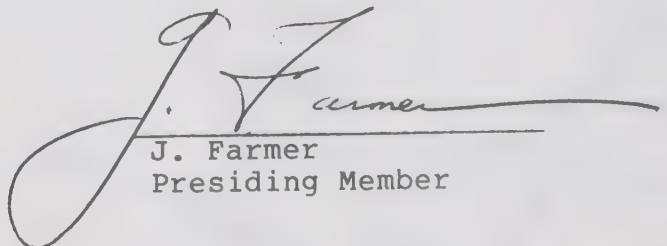


Recommendation

Having satisfied myself that the power and energy to be exported are surplus to foreseeable Canadian requirements and that the prices to be charged are just and reasonable in relation to the public interest, and having had regard to all other considerations that appear to me to be relevant, I recommend that the Board issue to Hydro-Québec a licence for the export of the requested amounts of interruptible power and energy for the period from the date of approval by the Governor in Council to 31 December 1983, subject to the terms and conditions set out in Appendix 5.

\* \* \* \* \*

I submit this, my report, to the National Energy Board in accordance with Section 14 of the Act. I respectfully recommend that it be adopted as the Board's own findings and decision on the application, as allowed under the said section.



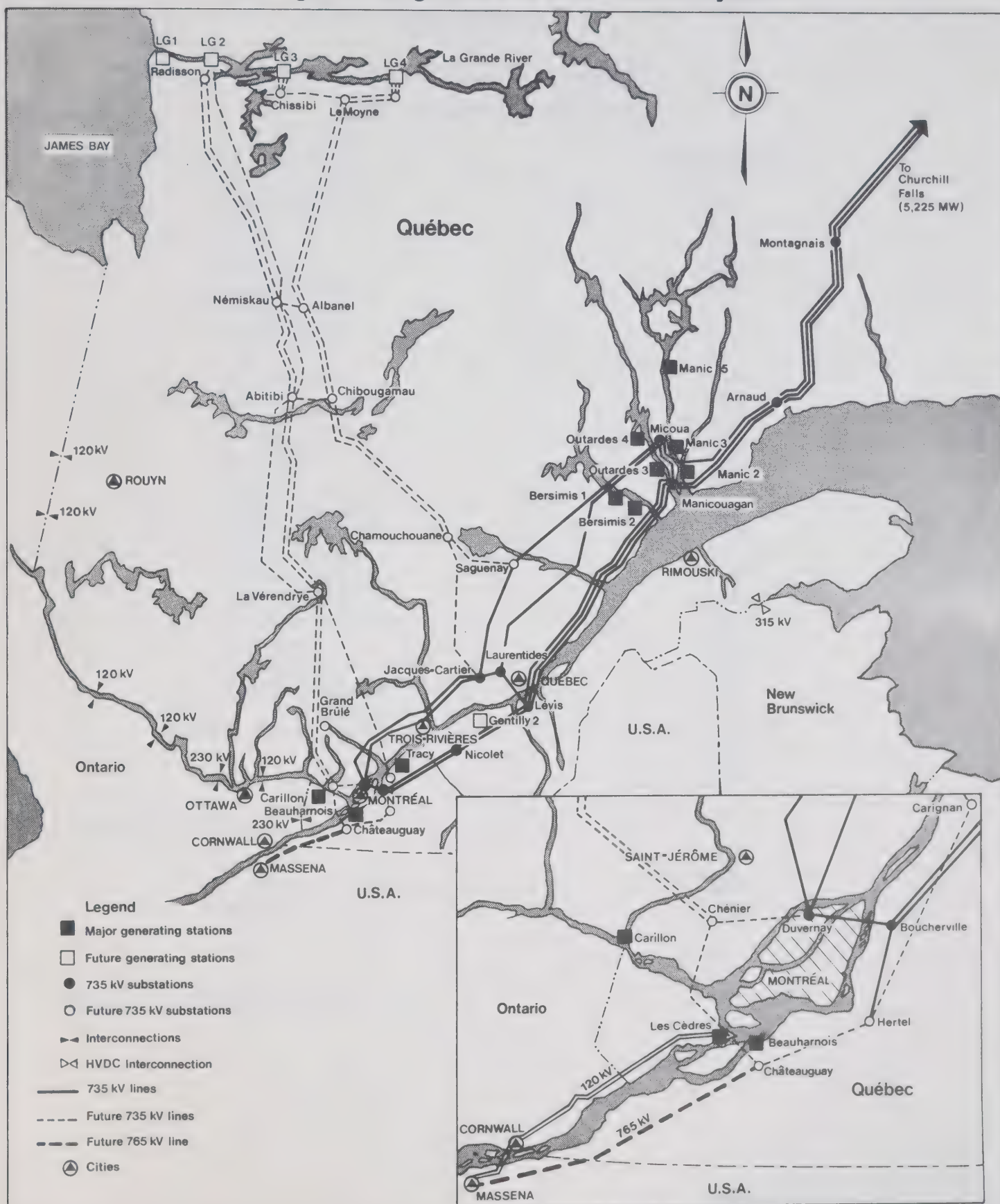
J. Farmer  
Presiding Member

Ottawa, Canada  
24 July 1978



# HYDRO-QUÉBEC

## Main generating stations and 735 kV system







HYDRO-QUEBECEXISTING GENERATING STATIONS

1977 Nameplate Capacity

<u>Hydroelectric Stations</u>	<u>(Megawatts)</u>
Beauharnois	1586
Manic 5	1292
Manic 3	1183
Manic 2	1015
Bersimis 1	912
Outardes 3	756
Bersimis 2	655
Carillon	655
Outardes 4	632
Trenche	286
Beaumont	243
La Tuque	216
Paugan	202
Manic 1	184
Rapide-Blanc	184
Shawinigan 2	163
Les Cèdres	162
Shawinigan 3	150
Grand-Mère	148
Première-Chute	124
Chelsea	144
La Gabelle	137
Rapide-des-Iles	147
Others, less than 100 MW	<u>538</u>
Total	11714
<u>Thermal Stations</u>	
Tracy	600
Cadillac (gas turbine)	162
Diesel	<u>60</u>
Total	822
<u>Hydro and Thermal Stations</u>	12536



## HYDRO-QUEBEC

POWER (MW)

Capacity, Demand and Surplus

		1979				1980				1981				1982				1983			
		1978		January		July		January		July		January		January		July		January		July	
		July																			
Capacity																					
1.	hydro	10,676	11,244	11,074	11,244	12,052	11,244	13,200	14,008	15,156	15,964	17,036	17,634								
2.	oil-Tracy	625	625	625	625	625	625	625	625	625	625	625	625								
3.	diesel	28	41	27	48	32	48	57	36	65	41	74	45								
4.	nuclear-Gentilly 2	0	0	0	635	635	635	635	635	635	635	635	635								
5.	gas turbines	164	164	164	404	404	404	606	606	606	606	633	633								
6.	total (1+2+3+4+5)	11,493	12,074	11,890	12,956	13,748	12,956	15,123	15,910	17,087	17,871	19,003	19,572								
7.	Firm purchases	4,436	5,083	4,399	5,383	4,199	5,383	4,933	4,199	4,709	4,025	4,559	3,875								
8.	Total capacity (6+7)	15,929	17,157	16,289	18,339	17,947	18,339	20,056	20,109	21,796	21,896	23,562	23,447								
Demand																					
9.	within the system	11,171	16,319	11,447	17,654	12,220	17,654	19,091	13,037	20,637	13,900	22,303	14,812								
10.	external to system	1,068	156	1,128	154	1,129	154	155	1,117	120	1,095	120	1,095								
11.	required reserve	1,325	1,491	1,491	1,659	1,659	1,659	1,841	1,841	2,043	2,043	2,267	2,267								
12.	total required (9+10+11)	13,564	17,966	14,066	19,467	15,008	19,467	21,087	15,995	22,800	17,038	24,690	18,174								
13.	Surplus (deficit) (8-12)	2,365	(809)	2,223	(1,128)	2,939	(1,128)	(1,031)	4,114	(1,004)	4,858	(1,128)	5,273								
14.	Interruptible demand*	300	360	360	420	420	420	480	480	540	540	600	600								
15.	Residual deficit (13-14)	-	449	-	708	-	708	551	-	464	-	528	-								

\* Primary industrial demand with interruptible clause included in the demand within the system, line 9.



# HYDRO-QUEBEC

## ANNUAL ENERGY (GWh)

### Capability, Load and Surplus under Average and Maximum Streamflows

Average Streamflows		1978	1979	1980	1981	1982	1983
1.	Capability						
2.	hydro	69,388	72,254	77,864	85,800	91,551	100,778
3.	oil-Tracy	100	100	100	100	100	100
4.	diesel	188	221	266	319	380	455
5.	nuclear-Gentilly 2	0	813	4,462	4,462	4,462	4,313
6.	gas turbines	0	0	0	0	0	0
7.	total (2+3+4+5+6)	69,676	73,388	82,692	90,681	96,493	105,646
8.	firm purchases	32,482	32,153	30,315	30,087	29,193	29,193
9.	Total capability (7+8)	102,158	105,541	113,007	120,768	125,686	134,839
10.	Load						
11.	within the system	87,796	94,174	101,628	109,605	118,151	127,304
12.	external to system	4,988	4,874	4,885	4,803	1,586	1,586
13.	Total (11+12)	92,784	99,048	106,513	114,408	119,737	128,890
14.	Surplus (9-13)	9,374	6,493	6,494	6,360	5,949	5,949
Maximum Streamflows*							
15.	Hydro capability	80,086	83,231	88,889	96,827	102,577	111,807
16.	Surplus (15+14-2) **	20,072	17,470	17,519	17,387	16,975	16,978

\* The probability of having maximum streamflows is approximately 5%.

\*\* The other capabilities and the load do not vary with the streamflow conditions.





TERMS AND CONDITIONS OF EXPORT LICENCE

1. The term of this licence shall commence on the day on which the licence is approved by the Governor in Council and shall end on the 31st day of December 1983.
2. The classes of inter-utility export transfer authorized hereunder are sale, exchange and adjustment transfers of interruptible power and energy.
3. The energy to be exported hereunder shall be transmitted over the international power lines for which the Board has issued Certificates of Public Convenience and Necessity numbered EC-III-15 and EC-10.
4. The quantity of energy that may be exported hereunder in any consecutive 12-month period throughout the term of the licence shall not exceed 10,200 GWh less any net exports under Licence No. EL-96.
5. The Licensee shall not export energy hereunder unless it is surplus to the firm energy requirements of economically accessible Canadian markets at the time it is exported.
6. The Licensee shall interrupt or curtail the delivery of energy hereunder whenever and to whatever extent such energy is required to supply
  - (a) any firm load within Canada, or
  - (b) any Canadian electrical utility willing to buy part or all of the energy at the same price as that of the export, adjusted for possible differences in the cost of delivery.
7. The price to be charged by the Licensee for exports made hereunder as sale transfers shall be not less than the price as calculated according to the method set forth for the applicable classification of transaction in the Memorandum of Interconnection Agreement dated 31 May 1976 between Power Authority of the State of New York and Quebec Hydro-Electric Commission, filed with the Board as Exhibit 4 at the hearing of the Licensee's application.



8. When electric energy exported hereunder is generated by the burning of fuel oil, the fuel price to be included in the incremental cost used in the formula for deriving the price of the energy shall be
  - (a) for imported fuel oil, or fuel oil made from imported crude, the price paid by the Licensee to the importer, plus the amount by which that price was reduced by any subsidy or compensation payment from any level of government in Canada, and
  - (b) for fuel oil made from Canadian crude, the export price of such Canadian fuel oil, including any export charge.
9. The Licensee shall forthwith file with the Board a report of each decision on the pricing of energy to be exported hereunder which is made by the Operating Committee described in Article VIII of the agreement referred to in Condition 7 hereof.
10. The Licensee shall not, without the prior approval of the Board, amend, enter into any agreement in substitution for or in addition to, or terminate, the agreement referred to in Condition 7 hereof.
11. The Licensee shall forthwith report to the Board the full details of each sale of Tertiary Energy made under the agreement referred to in Condition 7 hereof, by Telex or by the most expeditious means available at the time the sale is made.
12. The Licensee, within 15 days after the end of each month comprised in the term of this licence, shall file with the Board a report in such form and detail as the Board may specify, setting forth for that month
  - (a) the quantity of energy exported hereunder for each classification of transaction,
  - (b) the price and resulting revenue for energy of each classification, and
  - (c) all energy imports made by the Licensee under the agreement referred to in Condition 7 hereof, and the current month-end balance in each energy exchange account maintained by the Licensee with a utility in the United States of America.



6. When electric energy exported hereunder is generated by the burning of fuel oil, the fuel price to be included in the statement shall be the price of the fuel oil as shown on the energy label as
- (a) for imported fuel oil, or fuel oil made from imported crude, the price paid by the licensee to the importer, plus the amount by which that price was reduced by any subsidy or governmental payment from any level of government in Canada, and
- (b) for fuel oil made from Canadian crude, the export price of such Canadian fuel oil, including any export charges.
7. The licensee shall forthwith file with the Board a report of each transaction on the basis of which it is to be exported hereunder which, as required by the Board, shall be in the form of a statement of the following particulars:
- (a) The licensee shall forthwith report to the Board the full details of each sale of Electric Energy made under the agreement referred to in Condition 7 hereto, by type or by the more expeditious means available at the time the sale is made.
- (b) The licensee, within 15 days after the end of each month commencing in the last of this licence, shall file with the Board a report in such form and detail as the Board may specify, setting forth for each month:
- (a) the quantity of energy exported hereunder for each classification of transaction;
- (b) the price and resulting revenue for energy of each classification; and
- (c) all energy imported into the licensee under the agreement referred to in Condition 7 hereto, and the revenue month-end balance in each energy exchange account maintained by the licensee with a utility in the United States of America.

